Amendments to the Drawings

The attached drawing sheet (one (1) total) includes a formal drawing for new Fig. 8. The sheet, which includes Fig. 8 is new and replaces no previous sheets.

REMARKS

Claims 1-15, 17-20, 22-31, 33-39, 43-44, 47, 50, 52, 54, and 56-70 are currently pending. Claims 1, 7, 12, 19, 25-26, 28, 30, 31, 33-34, 43-44, 47, 50, and 52 have been amended and claims 42, 45-46, 48-49, 51, 53, and 55 have been cancelled with this response.

Applicants have added new Fig. 8 to illustrate a rotor that includes permanent magnet material that defines a circumferentially surrounding portion 62b that includes at least a portion that is not magnetized and a plurality of spoke portions 62a that are magnetized. The non-magnetized portion is shown cross-hatched in an X-pattern, while the magnetized portion is cross hatched in a conventional cross-hatched pattern. The specification has also been amended to describe the new figure in the Brief Description of Drawings section and to refer to the drawing in the detailed description. No new matter has been added as Fig. 8 is simply a visual representation of that which is described in the detail description and particularly in paragraph [0039] of the specification.

The Examiner rejected claims 19-20, 22-31, 42, 45-48, 49-52, and 55 under 35 U.S.C. §112, first paragraph.

Claims 19 and 52 have been amended to recite permanent magnet material in which at least a portion of a circumferentially surrounding portion is not magnetized, and an axially extending or angularly spaced portion is magnetized, which as noted by the Examiner, is clearly supported in the specification. Claim 25 has been amended to depend from claim 19 and no longer includes the rejected subject matter.

In light of the foregoing, Applicants respectfully request the withdrawal of the 35 U.S.C. §112 rejection of claims 19 and 52. In addition, Applicants respectfully request the withdrawal of the 35 U.S.C. §112 rejection of claims 20, 22-31, 47, and 50 which depend

from claim 19. Claims 42, 45-46, 48-49, 51, and 55 have been cancelled rendering their 35 U.S.C. §112 rejections moot.

The Examiner rejected claims 1, 3-6, 12-13, 15, 17, 33, and 36 under 35 U.S.C. §103(a) as being unpatentable over Nozawa (Japanese Patent No. JP 06-038415) in view of Sakamoto (JP 07-154935).

Amended claim 1 defines a rotor assembly for an electric motor. The rotor assembly includes a spoke permanent magnet rotor having an axis of rotation. A single body of permanent magnet material continuously circumferentially surrounds the axis of rotation to define a circumferential portion. The permanent magnet material continuously radially extends outwardly relative to the axis of rotation to form a plurality of outwardly extending portions. The circumferential portion defines a first interface surface. Ferro-magnetic material is positioned adjacent to the outwardly extending portions of permanent magnet material and includes an outer surface and a second interface surface formed inward of the outer surface that engages the first interface surface. The first interface surface and second interface surface are arranged to inhibit outward radial motion of the ferro-magnetic material.

Nozawa does not teach or suggest, among other things, a rotor that includes a single body of permanent magnet material that continuously circumferentially surrounds the axis of rotation, continuously radially extends outwardly relative to the axis of rotation to form a plurality of outwardly extending portions, and defines a first interface surface defined by the circumferential portion and engageable with a second interface surface formed inward of the outer surface of a ferro-magnetic material to inhibit outward radial motion of the ferro-magnetic material. Rather, Nozawa discloses a rotor construction that includes a plurality of separate permanent magnets 31a, 31b, 41. Pole pieces 32, 42 are positioned between the

permanent magnets. Nozawa does not teach or suggest a surface formed as part of the permanent magnet that engages a surface of ferro-magnetic material to inhibit outward radial movement of the ferro-magnetic material. Furthermore, Nozawa does not teach or suggest such a surface formed as part of the circumferential portion of the permanent magnet material that engages a surface of the ferro-magnetic material to inhibit outward radial movement of the ferro-magnetic material.

Sakamoto does not cure the deficiencies of Nozawa. Sakamoto discloses a rotor that includes a permanent magnet material that extends continuously around the axis of rotation and defines spokes that extend radially outward. However, Sakamoto does not teach or suggest a surface, formed as part of the circumferential portion of permanent magnet material that engages a surface formed as part of the pole piece to inhibit outward radial movement of the pole pieces. The circumferential portion of the permanent magnet material of Sakamoto defines smooth cylindrical surfaces that have no ability whatsoever to inhibit outward radial movement of the pole pieces disposed between the radially extending portions.

In light of the foregoing, Nozawa and Sakamoto, alone or in combination, do not teach or suggest each and every limitation of claim 1. As such, claim 1 is allowable. In addition, claims 2-15, 17-18, 43-44, and 56-57 depend from claim 1 and are allowable over Nozawa and Sakamoto for these and other reasons.

Amended claim 33 defines a rotor assembly for an electric motor. The assembly includes a spoke permanent magnet rotor having an axis of rotation. The assembly also includes permanent magnet material having a portion that continuously surrounds a portion of the axis of rotation to define a circumferential portion, and portions extending outwardly relative to the axis of rotation to form a plurality of outwardly extending spoke portions of

permanent magnet material. The permanent magnet material defines a plurality of interface surfaces. Each interface surface is disposed between adjacent outwardly extending spoke portions. Ferro-magnetic material forms a plurality of pole pieces. Each pole piece is positioned between a set of circumferentially adjacent outwardly extending spoke portions of permanent magnet material and includes a pole interface surface engageable with one of the plurality of interface surfaces to inhibit outward radial movement of the pole piece. The permanent magnet material includes molded plastic bonded permanent magnet material and a shaft supporting the spoke permanent magnet rotor for rotation about the axis of rotation.

Nozawa does not teach or suggest, among other things, a rotor that includes permanent magnet material that defines a circumferential portion and spoke portions and a plurality of interface surfaces disposed between adjacent outwardly extending spoke portions, the interface surfaces engageable with a pole interface surface to inhibit outward radial movement of the pole. Rather, Nozawa discloses a rotor that includes separate permanent magnet material pieces that define circumferential portions and spoke portions. However, the circumferential portions do not include any surface that could engage a pole piece and restrain its outward radial movement, much less a surface disposed between adjacent spoke portions.

Sakamoto does not cure the deficiencies of Nozawa. Sakamoto discloses a rotor that includes a permanent magnet portion that defines a circumferential portion and spoke portions. However, there is no surface or feature disposed between spoke portions that is engageable with the pole portion to inhibit movement of the pole portion in the radial direction. The only surfaces between the spoke portions that engage the pole pieces are the inner surfaces of the spokes themselves and the outer circumference of the circumferential portion. However, the inner surfaces of the spokes define a diverging angle and as such

cannot restrain outward radial movement of the pole pieces. The outer circumferential portion is smooth and also has no ability to inhibit outward radial movement of the pole piece.

In light of the foregoing, Nozawa and Sakamoto, alone or in combination, do not teach or suggest each and every limitation of claim 33. As such, claim 33 is allowable. In addition, claims 34-39, 52-54, and 62-63 depend from claim 33 and are allowable over Nozawa and Sakamoto for these and other reasons.

Claims 2-15, 17-18, and 43-44 depend from claim 1 and stand rejected under 35 U.S.C. §103(a) in view of Nozawa and Sakamoto in combination with one of Ferreira (U.S. Patent No. 5,204,572), Kawamato (Japanese Patent No. JP 08-223832), Cuenot (U.S. Patent No. 5,091,668), Noodleman (U.S. Patent No. 3,979,821), Nichiki (Japanese Patent No. JP 06-062541), Uchida (U.S. Patent No. 5,157,297), or Pop (U.S. Patent Publication No. 2002/0047426). In addition, claims 34-39 and 52-54 depend from claim 33 and stand rejected under 35 U.S.C. §103(a) in view of Nozawa and Sakamoto in combination with one of Kawamata, Cuenot, Noodleman, Nichiki, Yamamoto (Japanese Patent No. JP 2001359247), Uchida, or Pop.

Ferreira does not cure the deficiencies of Nozawa and Sakamoto. Ferreira discloses a rotor that includes an iron core 16 positioned around a shaft 26. A series of trapezoidal permanent magnets 36 extend substantially radially from the iron core to a circumference. A plurality of interpole members are positioned between adjacent permanent magnets and extend to the circumference. Ferreira does not disclose a circumferential portion of permanent magnet material and, as such cannot teach or suggest a circumferential portion defining a first interface surface. Furthermore, Ferreira does not teach or suggest a surface between adjacent spoke portions, formed as part of the permanent magnet, that inhibits outward radial

movement of the interpole members. The permanent magnet of Ferreira defines a diverging angle, and as such cannot inhibit outward radial movement of the interpole pieces.

Kawamata does not cure the deficiencies of Nozawa and Sakamoto. Kawamata discloses a rotor for an electric motor that includes a plurality of magnets embedded in the rotor. Each magnet extends substantially radially from a point near the axis of rotation to a point near the outer surface of the rotor. However, no portion of the magnets extends continuously around the axis of rotation as recited in claims 1 and 33. Rather, there is a gap between adjacent magnets. In addition, because there is no circumferential portion, there can be no interface surface defined by the circumferential portion as recited in claim 1. Furthermore, Kawamata does not teach or suggest a surface between adjacent spoke portions, formed as part of the permanent magnet, that inhibits outward radial movement of pole pieces. The permanent magnet of Kawamata defines a diverging angle, and as such cannot inhibit outward radial movement of the pole pieces.

Cuenot does not cure the deficiencies of Nozawa. Cuenot discloses a motor having flux concentrating permanent magnets 4. As illustrated in Fig. 2, the permanent magnets are substantially rectangular components arranged such that their long axes are substantially radial. However, each magnet 4 is separated from adjacent magnets by laminations. As such, the permanent magnets do not include a portion that continuously surrounds the axis of rotation. In addition, because Cuenot does not teach or suggest a permanent magnet that includes both a portion that surrounds the axis of rotation and spoke portions, Cuenot cannot possibly teach or suggest interface surfaces defined by the circumferential portion, as recited in claim 1. Furthermore, Cuenot does disclose a dovetail that inhibits outward radial

movement of the laminations. However, the dovetail is not formed as part of the permanent magnet, as recited in claim 33.

Noodleman does not cure the deficiencies of Nozawa and Sakamoto. Noodleman discloses a rotor that includes rare earth magnets positioned within slots defined by a plurality of stacked laminations. The slots and magnets are substantially rectangular such that the long axes of the rectangles are substantially radial. However, the magnets are separated from adjacent magnets such that there is no portion of magnet that extends continuously around the axis of rotation of the motor, as recited in claims 1 and 33. In addition, because Noodleman does not teach or suggest a permanent magnet that includes both a portion that substantially surrounds the axis of rotation and radially extending portions, Noodleman cannot possibly teach or suggest interface surfaces defined by the circumferential portion, as recited in claim 1. Furthermore, Noodleman does not teach or suggest a surface between adjacent spoke portions, formed as part of the permanent magnet, that inhibits outward radial movement of the laminations. The permanent magnet of Noodleman defines a diverging angle, and as such cannot inhibit outward radial movement of the laminations.

Nichiki does not cure the deficiencies of Nozawa and Sakamoto. Nichiki discloses a rotor that includes a shaft 22 and a magnet 21 that are integrally molded. The magnet is substantially cylindrical. As such, the magnet does not include a portion that continuously, or substantially, surrounds the axis of rotation *and* a plurality of outwardly extending spoke portions. In addition, the rotor of Nichiki does not teach or suggest ferro-magnetic material positioned adjacent the outwardly extending portions of permanent material. Thus, Nichiki cannot possibly teach or suggest an interface surface defined by the circumferential portion of permanent magnet material and engageable with a second interface surface defined by the

ferro-magnetic material to inhibit outward radial movement of the ferro-magnetic material. In addition, Nichiki cannot teach an interface surface disposed between adjacent spoke portions, when the rotor of Nichiki includes no such spoke portions.

Uchida does not cure the deficiencies of Nozawa and Sakamoto. Uchida discloses a rotor that includes a shaft 12a surrounded by a resin 22. A plurality of rectangular magnets 18 extend in a substantially radial direction and are separated by a plurality of rotor core sectors 20. Uchida does not teach or suggest a magnet that includes a portion that continuously surrounds the axis of rotation *and* a plurality of outwardly extending spoke portions, as recited in claim 1. Thus, Uchida cannot possibly teach or suggest an interface surface defined by the circumferential portion of permanent magnet material and engageable with a second interface surface defined by the ferro-magnetic material to inhibit outward radial movement of the ferro-magnetic material. In addition, Uchida cannot teach an interface surface formed as part of the permanent magnet material and disposed between adjacent spoke portions, when the rotor of Uchida includes only smooth flat surfaces between the spoke portions that are unable to restrain the core sector from moving outward in a radial direction.

Pop does not cure the deficiencies of Nozawa and Sakamoto. Pop discloses a rotor that includes a plurality of radially extending magnets 220 that extend radially outward from a shaft. Pop does not teach or suggest a permanent magnet portion that extends circumferentially around the axis of rotation. Thus, Pop cannot possibly teach or suggest an interface surface defined by the circumferential portion of permanent magnet material and engageable with a second interface surface defined by the ferro-magnetic material to inhibit radial movement of the ferro-magnetic material. In addition, Pop cannot teach an interface surface formed as part of the permanent magnet material and disposed between adjacent spoke

portions, when the rotor of Pop includes only smooth flat diverging surfaces between the spoke portions that are unable to restrain the laminations 212 from moving outward in a radial direction.

Yamamoto does not cure the deficiencies of Nozawa and Sakamoto. Yamamoto discloses a rotor that includes embedded permanent magnet portions that include a straight portion and two radially-extending portions. No portion of the embedded permanent magnet appears to include an interface surface that could engage an interface surface of a ferro-magnetic material to inhibit outward radial movement of the ferro-magnetic portion, much less the circumferential portion or a portion between the radially-extending portions.

In light of the foregoing, none of Ferreira, Kawamato, Cuenot, Noodleman, Nichiki, Uchida, Yamamoto, or Pop alone or in combination with Nozawa and Sakamoto teach or suggest the limitations of dependent claims 2-15, 17-18, 34-39, 43-44, and 52-54, much less claims 1 and 33. As such, claims 1 and 33 are allowable. In addition, claims 2-15, 17-18, 43-44, and 56-57, which depend from claim 1, and claims 34-39, 52-54, and 62-63, which depend from claim 33 are also allowable.

The Examiner rejected claims 19-20, 25, and 27-28 under 35 U.S.C. §103(a) as being unpatentable over Nozawa in view of Yamamoto (JP 2001-359247).

Amended claim 19 defines a rotor assembly for an electric motor. The rotor assembly includes a permanent magnet rotor having an axis of rotation. A portion of permanent magnet material surrounds a portion of the axis of rotation and includes at least a portion that is not magnetized. A plurality of angularly spaced spoke portions of permanent magnet material extend outwardly from the portion of permanent magnet material and are magnetized. Ferro-magnetic material is positioned between the angularly spaced spoke portions of permanent

magnet material and a shaft supports the permanent magnet rotor for rotation about the axis of rotation.

Nozawa does not teach or suggest, among other things, a rotor that includes a portion of permanent magnet material that surrounds a portion of the axis of rotation and includes at least a portion that is not magnetized and a plurality of angularly spaced spoke portions of permanent magnet material that extend outwardly from the portion of permanent magnet material and are magnetized. Rather, Nozawa discloses a motor that includes separate magnets that define a circumferential portion and spoke portions. As illustrated in Figs. 3 and 4, both the circumferential and spoke portions are magnetized.

Yamamoto does not cure the deficiencies of Nozawa. Yamamoto discloses a rotor that includes embedded permanent magnet portions that include a straight portion and two radially-extending portions. However, as illustrated in Fig. 2, the entire embedded permanent magnet portion appears to be magnetized. As such, Yamamoto does not teach or suggest a rotor that includes a permanent magnet portion that includes at least a portion that is not magnetized, much less a continuous circumferential portion that includes at least a portion that is not magnetized.

In light of the foregoing, Nozawa and Yamamoto, alone or in combination, do not teach or suggest each and every limitation of claim 19. As such, claim 19 is allowable. In addition, claims 20, 22-31, 47, 50, and 58-61 depend from claim 19 and are allowable over Nozawa and Yamamoto for these and other reasons.

Claims 20, 22-24, 26-31, 47, and 50 depend from claim 19 and stand rejected under 35 U.S.C. §103(a) in view of Nozawa and Yamamoto in combination with one of Uchida, Pop, Cuenot, Noodleman, or Nichiki.

Uchida does not cure the deficiencies of Nozawa and Yamamoto. Uchida discloses a rotor that includes a shaft 12a surrounded by a resin 22. A plurality of rectangular magnets 18 extend in a substantially radial direction and are separated by a plurality of rotor core sectors 20. Uchida does not teach or suggest a magnet that includes a portion that continuously surrounds the axis of rotation *and* a plurality of outwardly extending spoke portions, as recited in claim 19. Thus, Uchida cannot possibly teach or suggest magnetizing the spoke portions and not magnetizing at least a portion of the circumferential portion, as Uchida does not teach or suggest the use of a circumferential portion.

Pop does not cure the deficiencies of Nozawa and Yamamoto. Pop discloses a rotor that includes a plurality of radially extending magnets 220 that extend radially outward from a shaft. Pop does not teach or suggest a permanent magnet portion that extends circumferentially around the axis of rotation. Thus, Pop cannot possibly teach or suggest magnetizing the spoke portions and not magnetizing at least a portion of the circumferential portion, as Pop does not teach or suggest the use of a circumferential portion.

Cuenot does not cure the deficiencies of Nozawa and Yamamoto. Cuenot discloses a motor having flux concentrating permanent magnets 4. As illustrated in Fig. 2, the permanent magnets are substantially rectangular components arranged such that their long axes are substantially radial. However, each magnet 4 is separated from adjacent magnets by laminations. As such, the permanent magnets do not include a portion that continuously surrounds the axis of rotation. In addition, because Cuenot does not teach or suggest a permanent magnet that includes both a portion that surrounds the axis of rotation and spoke portions, Cuenot cannot possibly teach or suggest magnetizing the spoke portions and not magnetizing at least a portion of the circumferential portion.

Nichiki does not cure the deficiencies of Nozawa and Sakamoto. Nichiki discloses a rotor that includes a shaft 22 and a magnet 21 that are integrally molded. The magnet is substantially cylindrical. As such, the magnet does not include a portion that continuously, or substantially, surrounds the axis of rotation *and* a plurality of outwardly extending spoke portions. In addition, the rotor of Nichiki does not teach or suggest ferro-magnetic material positioned adjacent the outwardly extending portions of permanent material. Thus, Nichiki cannot possibly teach or suggest not magnetizing at least a portion of the circumferential portion of permanent magnet material, while magnetizing the spoke portions of permanent magnet material as the device of Nichiki does not include a circumferential portion of magnetic material.

Noodleman does not cure the deficiencies of Nozawa and Sakamoto. Noodleman discloses a rotor that includes rare earth magnets positioned within slots defined by a plurality of stacked laminations. The slots and magnets are substantially rectangular such that the long axes of the rectangles are substantially radial. However, the magnets are separated from adjacent magnets such that there is no portion of magnet that extends continuously around the axis of rotation of the motor. In addition, because Noodleman does not teach or suggest a permanent magnet that includes both a portion that substantially surrounds the axis of rotation and radially extending portions, Noodleman cannot possibly teach or suggest not magnetizing at least a portion of the circumferential portion of permanent magnet material and magnetizing the outwardly extending spoke portions.

In light of the foregoing, none of Uchida, Pop, Cuenot, Nichiki, or Noodleman alone or in combination with Nozawa and Yamamoto teach or suggest the limitations of dependent

claims 20, 22-25, 26-31, 47, and 50, much less claim 19. As such, claim 19 is allowable. In addition, claims 20, 22-31, 47, 50, and 58-61, which depend from claim 19 are also allowable.

New claim 64 includes limitations similar to those discussed with regard to claims 1, 19, and 33. As such, claim 1 is allowable for the reasons set forth with regard to claims 1, 19, and 33 as well as other reasons. In addition, claims 65-70 depend from claim 64 and are allowable for these and other reasons.

CONCLUSION

In light of the foregoing, Applicants respectfully submit that claims 1-15, 17-20, 22-31, 33-39, 43-44, 47, 50, 52, 54, and 56-70 are allowable.

The undersigned is available for telephone consultation during normal business hours.

Respectfully submitted,

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